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### PROVISIONAL SPECIFICATION.

## Improvements in Methods for Imparting Elasticity or Stretch to Paper or Fabric.

I, HAROLD JACKSON, of Oakenclough Paper Works, Oakenclough, Garstang, County of Lancaster, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to an improved method for imparting stretch or pleats longitudinally to reels or lengths of paper or fabric by means of pleats or crinkles running lengthways of the reel or length so as to secure elasticity or stretch crossways on the web of paper or fabric.

A paper has already been manufactured which is stated to have stretch or elasticity in both directions, the stretch lengthways thereof being obtained by the usual well known method of crepeing or crinkling and the stretch crossways being obtained by passing the paper in a moist or slightly damped condition through an embossing device. Such a method only secures a very limited amount of stretch or elasticity crossways of the paper and is obtained entirely from the stretching of the paper whilst damp or moist and it therefore gives a corresponding weakness to the paper owing to the intermovement between the fibres forming the structure of the paper, which movement necessarily occurs when the paper is stretched to obtain the requisite embossing.

To secure longitudinal pleating or crinkling on a reel or web of paper or fabric without impairing its strength to a serious extent it is essential that the edges of the web must converge, i.e. the web become narrower under treatment. Thus if 20% of elasticity or stretch is required, the width of web after treatment must be approximately 20% less than before treatment. The stretch or elasticity thus corresponds with the amount the web is narrowed and a greater or less stretch or elasticity may be obtained by a greater or less narrowing of the width of the web.

The method of securing stretch or elasticity crossways on a web of paper or fabric according to the present invention thus consists in forming pleats or wrinkles lengthways of the web and at the same time causing or allowing the edges to

converge so that the web becomes narrower to an amount approximately equal to the amount of stretch or elasticity required.

The requisite narrowing of the web is obtained by passing it, preferably in a moist condition, between two sets or series of converging guides, wires or strings rollers or grooved rollers—one set of guides being under the web and the other set above it. The guides, strings or wires may be stationary or may move with the web as the pleats or crinkles are formed therein.

The following is a description of one way in which the invention can be carried out and in this description it is intended that the word "guide" shall be taken to include strings, wires or any other suitable form of guide:—

A central guide is arranged to be engaged by the central longitudinal line of the web and is parallel with the edges of the web. On each side of the central guide are arranged a number of other guides which converge towards the central guide in the direction of travel of the web, and also towards its neighbour nearer to the centre guide so that a more or less uniform contraction will be given to the whole width of the web. The convergence of the outer guides corresponds to the degree of elasticity or stretch it is desired to impart to the web. Thus if stretch or 20% is desired each guide will converge a corresponding degree towards its neighbour. The number of guides employed is that required to impart the desired number and spacing of longitudinal pleats or crinkles in the web and the size of the guides will control the size of each pleat or crinkle.

There are two similar or suitable series or sets of guides one set of which engage with the upper surface of the web and the other with the under surface thereof. The upper and lower set of guides preferably converge and intersect as the web travels through them, such convergence corresponding with the convergence in a flat or horizontal plane but being a convergence vertically so that when the web reaches the point on the guides where contact between them and the web ceases

the vertical convergence holds the slackness which the horizontal convergence has made possible without stretching the web.

On reaching this point the web has a corrugated appearance longitudinally and it may be dried in this form or it may be first passed between rollers and the corrugations lightly pressed into pleats or folds.

If desired the vertical convergence of the guides may be arranged to occur or impinge diagonally so that the central guide may receive its share of the web before the outer guides or so that each guide starting from the central guide receives its share of the web consecutively.

Instead of the web being narrowed by causing both edges to converge towards the centre, one edge may remain parallel and the other edge caused to converge towards it. For obtaining such result all the guides converge towards one side of the web, each succeeding guide preferably

having a greater inclination than the preceding one, the guide adjacent to the parallel edge having the least inclination and that furthest therefrom the greatest inclination. In this way the pleats or wrinkles travel across the web instead of converging to the centre thereof.

The hereinbefore described method of imparting stretch or elasticity to a length of paper or fabric may be applied to plain or flat, or to creped or wrinkled paper when being manufactured on the paper machine, or it may be applied to paper already made whether flat or creped or crinkled paper, so as to secure stretch or elasticity in both directions of the paper i.e.—both lengthway and across.

Dated this 20th day of April, 1931.

J. OWDEN O'BRIEN & SON,

Late W. P. Thompson & Co., of Manchester,  
Patent Agents.

## COMPLETE SPECIFICATION.

### Improvements in Methods for Imparting Elasticity or Stretch to Paper or Fabric.

I, HAROLD JACKSON, of Oakenclough Paper Works, Oakenclough, Garstang, County of Lancaster, a British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a method for treating webs or lengths of paper or fabric to secure elasticity or stretch crossways on the web of paper or fabric by means of pleats or crinkles running lengthways of the reel or length.

A paper has already been manufactured which is stated to have stretch or elasticity in both directions, the stretch lengthways thereof being obtained by the usual well known method of créping or crinkling and the stretch crossways being obtained by passing the paper in a moist or slightly damped condition through an embossing device or machine in which the paper is stretched into corrugations. Such a method only secures a very limited amount of stretch or elasticity crossways of the paper and is obtained entirely from the stretching of the paper whilst damp or moist and it therefore gives a corresponding weakness to the paper owing to the intermovement between the fibres forming the structure of the paper, which movement necessarily occurs when the paper is stretched to obtain the requisite embossing.

To secure longitudinal pleating or crinkling on a reel or web of paper or fabric without impairing its strength to a serious extent it is essential that the edges of the web must converge i.e. the web become narrower under treatment to the full extent of the length of paper taken up in the depth of the several corrugations. Thus if 20% of elasticity or stretch is required, the width of web after treatment must be approximately 20% less than before treatment. The stretch or elasticity thus corresponds with the amount the web is narrowed and a greater or less stretch or elasticity may be obtained by a greater or less narrowing of the width of the web.

It has been proposed to form pleats, crinkles or corrugations lengthways of the web while simultaneously causing or allowing the edges to converge and the web to become narrower to an amount approximately equal to the accumulated depth of the several crinkles, pleats or corrugations and to the amount of stretch or elasticity required by means of a travelling apron or carrier composed of metal bars or lags with parallel corrugations on their faces and a stationary steam heated former of triangular shape having longitudinal parallel corrugations gradually increasing in number from its front end towards its rear end.

It has also been proposed to crinkle paper longitudinally between co-operating

ribbed plates with converging ribs engaging throughout their length but such construction does not permit of the gradual contraction in width in proportion to the accumulated depth of the crinkles.

According to the invention the apparatus for crinkling or corrugating paper comprises two sets or series of guides or ribs the guides or ribs converging towards each other horizontally and vertically to simultaneously pleat, crinkle or corrugate the web longitudinally and contract it in width in proportion to the accumulated depth of the crinkles or corrugations. In carrying out the invention the requisite narrowing of the web is obtained by passing it, preferably in a moist condition and preferably as it leaves the rollers of the paper machine before drying between two sets or series of converging guides, wires strings, ribs ribbed rollers, or grooved or ribbed belts one set of guides being under the web and the other set above it. The guides, strings or wires may be stationary or may move with the web as the pleats or crinkles are formed therein.

The invention will be fully described with reference to the accompanying drawings:—

Fig. 1. Diagrammatic plan of one form of guide wires.

Fig. 2. Transverse section of same on line 2—2.

Fig. 3. Transverse section on line 3—3.

Fig. 4. Transverse section on line 3—3 of alternative construction.

Fig. 5. Side elevation (enlarged) of one pair of guide wires  $a, a^1$ .

Fig. 6. Diagrammatic plan of another form of guide.

Fig. 7. Transverse section enlarged of the delivery end.

Fig. 8. Diagrammatic plan of another form.

Hereinafter the word "guide" shall be taken to include wires, strings, grooved or ribbed rollers or bands converging one upon the other.

In the form shown in Figs. 1 to 5 the apparatus comprises two sets  $A, A^1$  of guide wires  $a, a^1$  the guide wires of each set converge towards each other horizontally, and the two sets converge vertically until the wires  $a, a^1$  are in the same or approximately the same plane. The guide wires of one or both sets are so disposed relatively to those of the other set that the web of paper as it moves forward will be brought successively into contact with each pair of guides and drawn or pressed in between them.

The central guide  $a^2$  is disposed to be first engaged by the web of paper on its central longitudinal line or longitudinal

axis and is parallel with the edges of the web.

The other guides  $a, a^1$  are arranged on each side of the central guide  $a^2$  and each converges towards it in the direction of travel of the web, and also towards its adjacent neighbour to impart a more or less uniform contraction over the whole width of the web. The convergence of the guides  $a, a^1$  towards the centre guide  $a^2$  and to each other corresponds to the degree of elasticity or stretch it is desired to impart to the web. Thus if stretch of 20% is desired each guide will converge a corresponding degree towards its neighbour. The number of guides employed is that required to impart the desired number and spacing of longitudinal pleats or crinkles in the web and the size of the guides and the space between them will control the size of each pleat or crinkle.

The two sets of guides  $A, A^1$  are similar the set  $A$  engaging the upper surface of the paper web and the set  $A^1$  the under surface and they converge until the upper set  $A$  intersect the plane of the lower set  $A^1$  as the web of paper travels between them such convergence corresponding with the convergence in a flat or horizontal plane but being a convergence vertically so that when the web reaches the point on the guides where contact between them and the web ceases the vertical convergence holds the slackness which the horizontal convergence has made possible without stretching the web.

On reaching this point the web has a crinkled or corrugated appearance longitudinally and it may be dried in this form or it may be first passed between rollers and the corrugations lightly pressed into pleats or folds.

In the form shown in Figs. 6 and 7 the guides  $a, a^1$  are formed upon two rubber or elastic ribbed belts or bands  $A^2, A^3$  which are capable of being expanded or drawn out laterally to widen the distance or the grooves between the guides. The bands are expanded laterally where the web of paper enters between them by stenter clips or stenter chain  $B$  until they are approximately flat and are contracted towards the point where the paper leaves them. The damp paper rests upon and between the guides  $a, a^1$  and as the bands are contracted they fold it into longitudinal pleats or crinkles between the ribs.

In the form shown in Fig. 8 the elastic ribbed band may be passed over a convex roller to expand it to an approximately smooth surface where the paper web engages it and over a cylindrical or concave roller to contract it where the paper web leaves it folding the paper into crinkles

or creases between the ribs as the band contracts.

In a further form a succession of grooved or ribbed rollers with varying numbers of guides or ribs may be employed between which the webs of damp paper will travel. Thus the first pair of rollers may have one central rib and groove and each successive pair of two additional ribs and grooves.

It is desirable that the vertical convergence of the guides  $a^1$  (as shown in Figs. 3 and 4) may occur or the guides impinge diagonally whereby the central guide may receive its share of the web before the outer guides and each guide starting from the central guide receives its share of the web consecutively, thereby allowing the web of paper to gradually contract in width as the crinkles or pleats are formed without putting any stretch or strain upon it.

Or the central pair of guides  $a^2$  may be longer than the adjacent ones and each succeeding pair of top and bottom guides be shorter than the preceding pair, thus gradually contracting and crinkling the web from the centre outwards without putting any stretch or strain upon the fibres of the material.

Instead of the web being narrowed by causing both edges to converge towards the centre, one edge may remain parallel and the other edge caused to converge towards it. For obtaining such result all the guides converge towards one side of the web, each succeeding guide preferably having a greater inclination than the preceding one, the guide adjacent to the parallel edge having the least inclination and that furthest therefrom the greatest inclination. In this way the pleats or crinkles travel across the web instead of converging to the centre thereof.

The hereinbefore described method of imparting stretch or elasticity to a length of paper or fabric may be applied to plain or flat, or to transversely creped or crinkled paper when being manufactured on the paper machine; or it may be applied to paper already made whether flat or creped or crinkled transversely so as to secure stretch or elasticity laterally or in both directions of the paper i.e.—both lengthway and across.

Having now particularly described and

ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Apparatus for crinkling or corrugating a web of paper longitudinally to impart stretch or elasticity transversely of the web comprising two sets or series of guides or ribs, the guides or ribs converging towards each other horizontally and vertically to simultaneously pleat, crinkle or corrugate the web longitudinally and contract it in width in proportion to the depth of the crinkles or corrugations.

2. The method of pleating, crinkling or corrugating paper or fabric longitudinally to give it lateral stretch or elasticity consisting in simultaneously crinkling the web longitudinally and contracting it in width in proportion to the accumulated depth of the crinkle by passing it between guides converging towards each other horizontally and converging on the web vertically while the edges of the web remain free to contract.

3. Apparatus as in claim 1 each set of guides comprising a number of guide wires converging towards the centre and towards each other.

4. Apparatus as in claim 1 comprising two elastic bands carrying guides or ribs on their surfaces mounted on stenter clips or chains which expand the bands at one end to impart a horizontally converging position to the guides or ribs thereon.

5. A paper or fabric provided with longitudinal pleats, crinkles or corrugations to give it stretch or elasticity transversely either with or without transverse crinkles to give it stretch or elasticity longitudinally produced by the method or apparatus claimed in any of the claims.

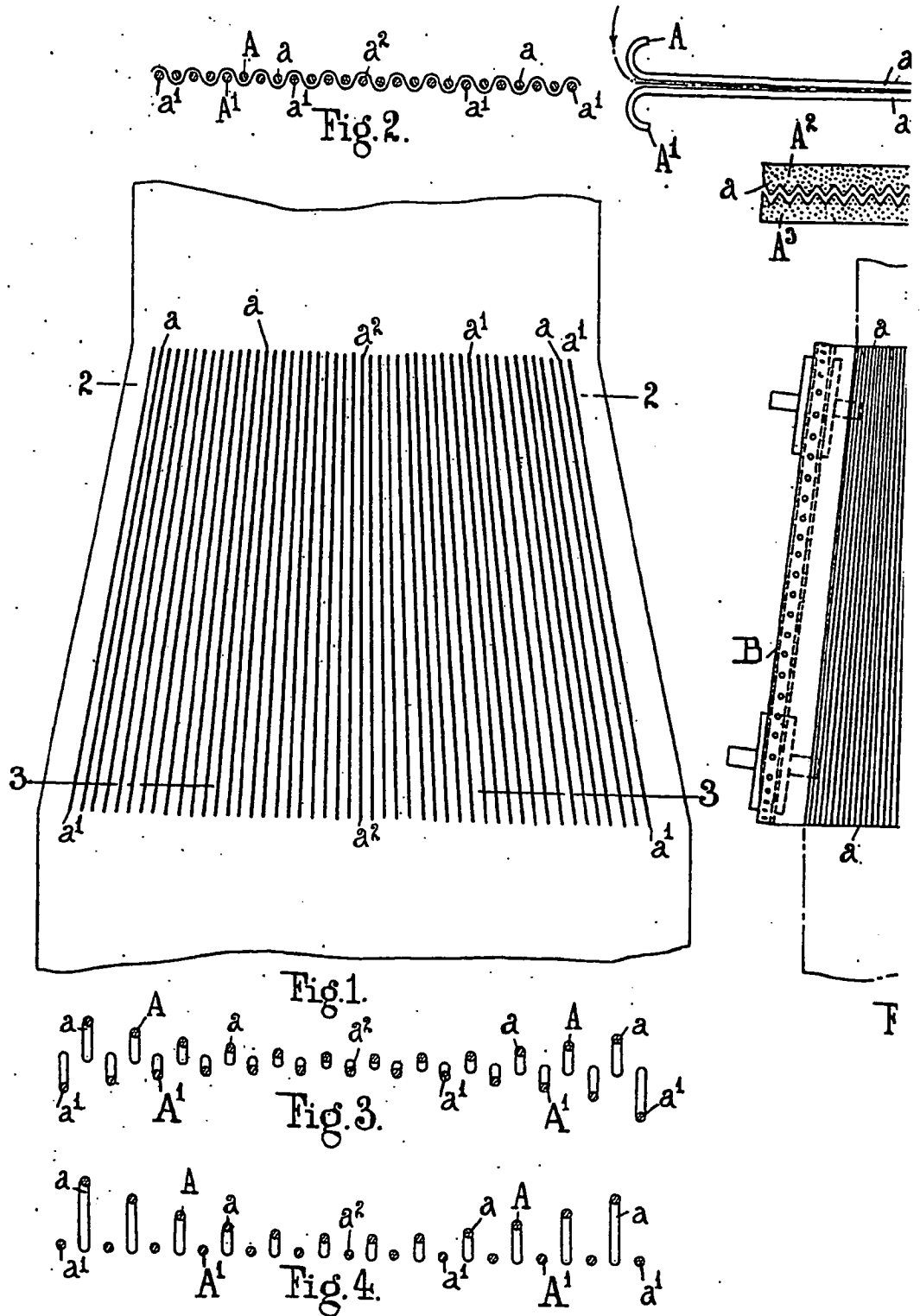
6. Apparatus for carrying out the method claimed in claim 2 comprising a series of grooved or ribbed rollers having a successively increasing number of ribs and grooves substantially as described.

7. Apparatus substantially as herein described and shown with reference to Figs. 1 to 5 or Figs. 6 and 7 or Fig. 8 of the accompanying drawings.

Dated this 15th day of January, 1932.

J. OWDEN O'BRIEN & SON,  
Late W. P. Thompson & Co., of  
Manchester,  
Patent Agents.

[This Drawing is a reproduction of the Original on a reduced scale.]



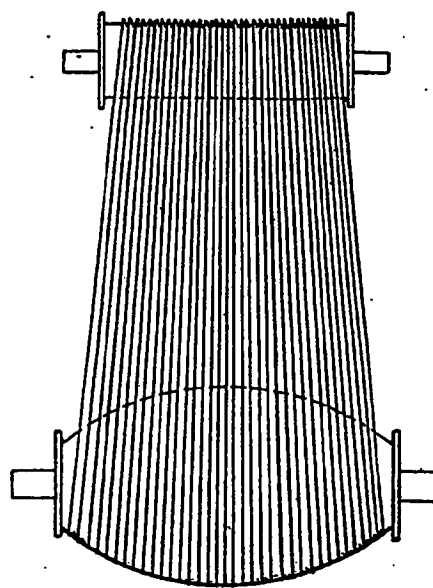
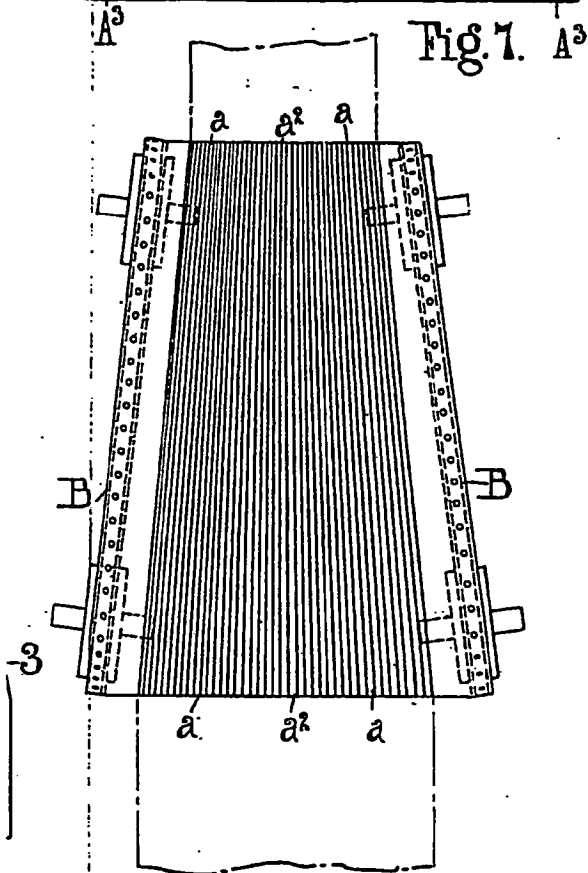
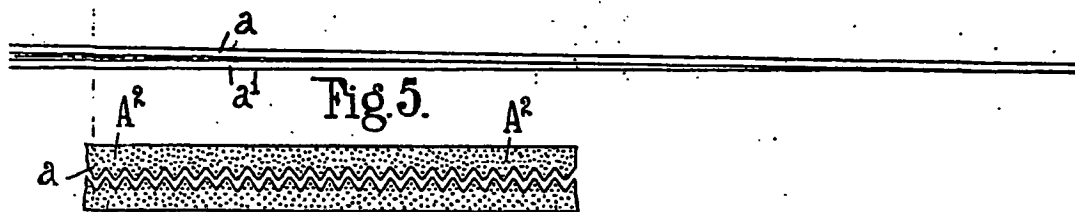


Fig. 8.

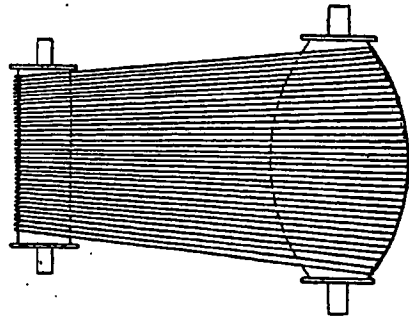
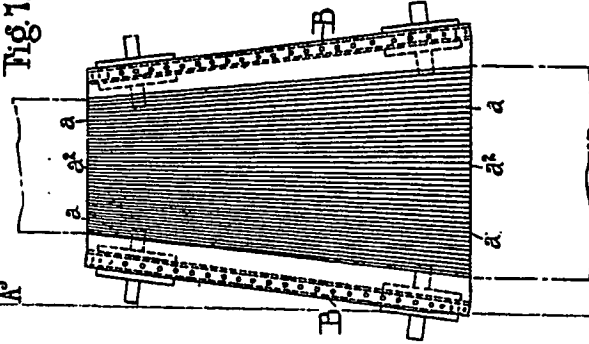
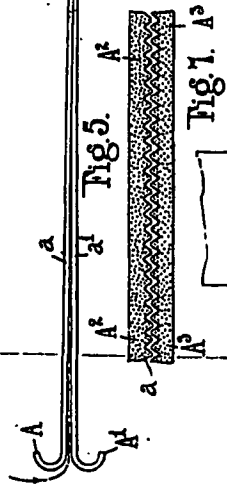
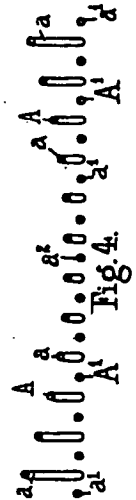
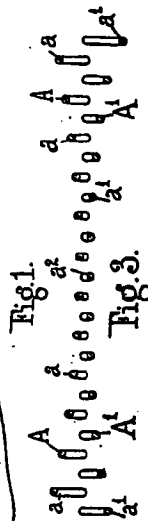
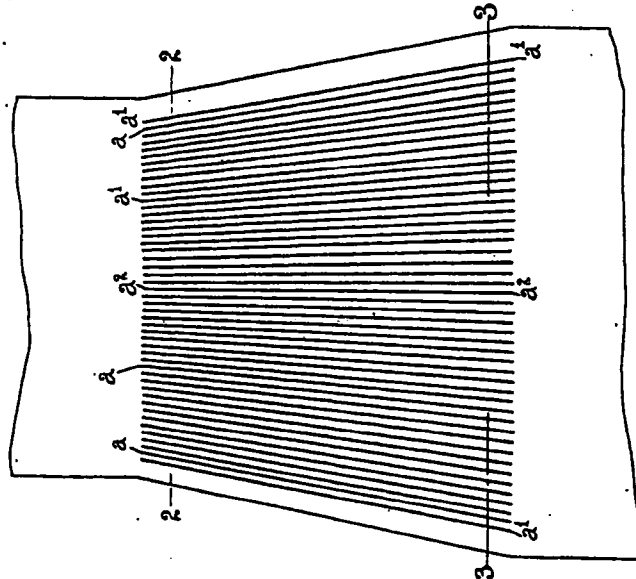
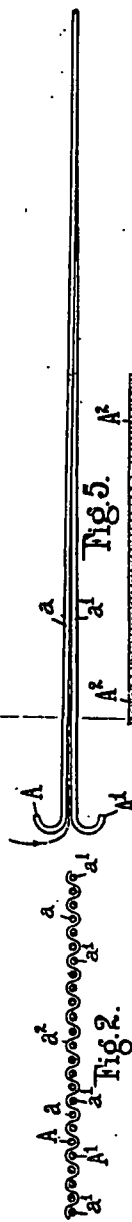


Fig. 8.

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**No title available.**

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**Abstract**

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